

Zero Retries issue 0127 2023-12-01

Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with ~~1000~~ 1100+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

In this issue:

- Request To Send
- AMSAT-CA Formed
- Amateur Radio Will Soon Lose Use of Most of the 1240 - 1300 MHz Band
- Digital Voice *or* Data - *Not* an Either Or Choice
- More Thoughts on IPv6 - No “44Net” within IPv6
- ZR > BEACON
 - SDRconnect Preview 2 released
 - Tesla Cybertruck Uses 48 Volt Internal Bus
 - “[Radio] Modems Are Hard”
 - Will It *Ham*?
 - Navigation Satellite (GNSS) Interference Is Very Real
 - Hambrew Magazine
 - BBC Basic Is Now Open Source (and Cross Platform)
- Feedback Loop
- Join the *Fun* on Amateur Radio
- Closing The Channel

Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0127>

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

My thanks to Paid Subscriber (upgraded from Free) **Prefers to Remain Anonymous 18** for becoming a Paid Subscriber to Zero Retries!

Financial support is a real vote of confidence for continuing to publish Zero Retries.

1100+ Subscribers Thanks to QSO Today Podcast

The Zero Retries subscriber count had been bumping along just under 1100 for the past two weeks, but it quickly ticked up to, then substantially *passed* 1100 as listeners of Eric Guth 4Z1UG's [QSO Today Podcast](#) discovered Zero Retries from my interview with 4Z1UG, and subscribed.

QSO Today Podcast Interview

I was honored to be interviewed by 4Z1UG on QSO Today as [Episode 477 - Steve Stroh - N8GNJ](#).

Steve Stroh, N8GNJ, has always enjoyed the confluence of computers, data communications, and amateur radio from the earliest days of AX.25 packet radio to the current AREDN and SDR (software defined radio). Steve uses his Zero Retries newsletter on Substack, to communicate the amazing amateur radio technology developments in data communications that does not get covered in the standard amateur radio journals. N8GNJ shares his experience and interesting stories in this QSO Today.

If you're not a regular podcast listener (don't use a podcast player app), but want to listen to this one, there's an audio player function on the web page - just click the [Listen to Podcast button](#).

As with all good conversations, it went by *entirely* too fast and it was *way* too much fun chatting. 4Z1UG is a skilled interviewer and he got me telling stories about my background that I've seldom mentioned. We got to a stopping point several times and then one last question would spark another round of discussion. Even with our longer discussion, there was so much that we didn't get a chance to discuss, such as the remarkable history of the packet radio activity in the Seattle area which proved out the utility of using dedicated repeaters for Amateur Radio data communications (and "slow speed TCP/IP"), the extensive HamWAN network in Western Washington, and the potential of MMDVM-TNC to revitalize Amateur Radio repeater usage for both data and voice operations.

One tidbit I learned about 4Z1UG was that he has, or had, family in nearby Sequim, Washington so maybe we'll be able to meet up at some point in the future if he returns for a visit.

As I explained to 4Z1UG, I've been a fan of his QSO Today podcasts for some time. I wrote in **Zero Retries 0042** - QSO Today "Zero Retries Interesting" Interviews

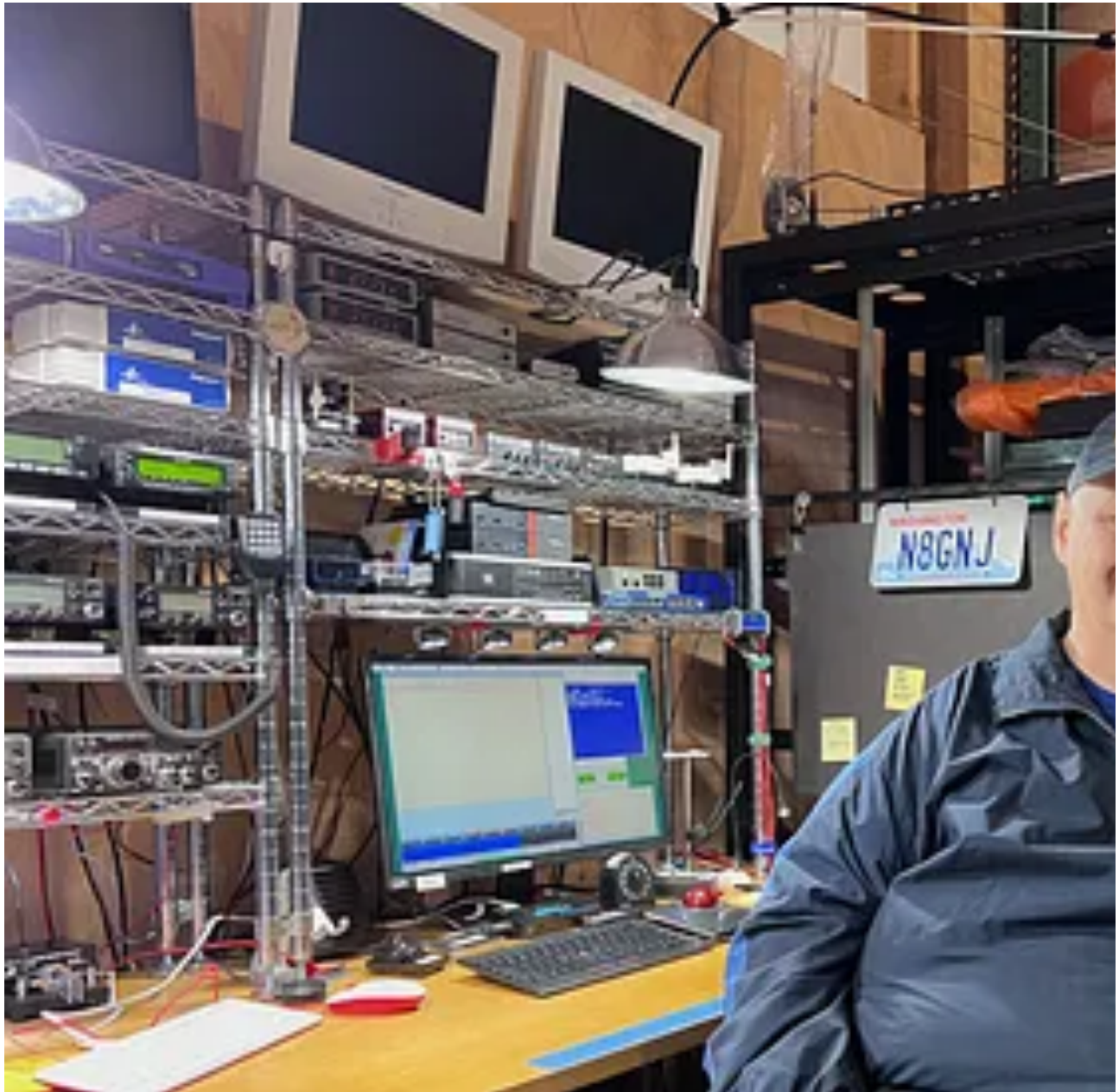
As mentioned in Zero Retries 0025, Eric Guth 4Z1UG has done the [QSO Today podcast](#) since July, 2014. 4Z1UG interviews one notable Amateur Radio Operator per episode, and as I wrote this (a few months ago now), he has conducted [more than 375 interviews](#).

Since I was looking at 4Z1UG's previous interviews for background listening while I'm doing hands-on, no-concentration-needed tasks, I thought I'd offer my *highly* subjective list of "Zero Retries Interesting" interviews from QSO Today. To compile this list, I skimmed the list for familiar names and callsigns. To be clear, I doubt 4Z1UG has interviewed anyone who isn't interesting, but my interests run towards technical topics. Hopefully I can eventually listen to the entire archive of QSO Today.

I listed a number of episodes up through 100. Given that my interview was Episode 477, sadly, I'm even further behind on listening to all the Zero Retries Interesting interviews now than I was then as 4Z1UG has continued to interview more Zero Retries Interesting folks. After my interview I spent time with my podcast app downloading a lot of 4Z1UG's ZRI interviews and have made some time listening to them as I returned my shack desk to reasonable organization.

Something I had not appreciated about QSO Today is that 4Z1UG is on something of a mission to preserve the oral history of as many Amateur Radio Operators as he is able. I think that is quite a worthy mission (477 of us to date, with some replay episodes), and thus I'm even more humbled to have been one of those "oral histories" of *my* Amateur Radio experiences.

As you might guess, the "shack photo" I hinted at last week was for QSO Today... so, I might as well get this over with for Zero Retries:



Steve Stroh N8GNJ at his radio desk 2023-11 - Photo by Tina Stroh KD7WSF

This is my radio desk returned to minimal functionality. It's gotten even better in the weeks since that photo was taken.

Nice mentions of Zero Retries in Hot Iron #122

The subscriber count for Zero Retries also got a nice bump this week from two mentions in the latest issue of [Hot Iron #1221](#) which is a delightful newsletter for Amateur Radio homebrew fans:

Zero Retries newsletter #122 has several articles of interest, including FCC's proposal to delete symbol rate limitations and the new Elecraft KH-1 CW-only hand-held transceiver. Click the link!

and

Zero Retries is an independent newsletter promoting technological innovation in Amateur Radio. The most recent edition has a number of articles of interest, including repurposing surplus portable light towers, SDR and much more.

My thanks to Peter Thornton G6NGR and Frank Barnes W4NPN for mentioning Zero Retries to the Hot Iron readership.

Amateur Radio Data Communications Interoperability Test Fixture

In other news from **N8GNJ Labs**, my thanks to Tadd Torborg KA2DEW for his donation of five 2m and three 70cm radios (stored, for the moment, in the bottom storage bin) as the basis of my proposed "Amateur Radio Data Communications Interoperability Test Fixture"[2](#), the very rough beginnings of

which are shown in the photo below.



P.R.I.M.P. (barely a concept) 2023-11 - Photo by Steve Stroh N8GNJ

I had always intended that this rack would house a bunch of radios and data communications interfaces and would have been labeled (or still might, I guess) as:

P.R.I.M.P. (Packet Radio Interoperability Messaging Processor)

Very long term Internet users might remember the acronym **IMP** for [Interface Message Processor](#), which was the original implementation of a what we now know as a router. The IMPs were built from military minicomputers in an impressive steel electronics cabinet (see the link). When I found this big blue steel rack years ago, I wanted to do something interesting with it, and at some point saw the photo of an IMP and thus **P.R.I.M.P.** seemed interesting, curious, and techie (at least it did to *me*).

73,

Steve N8GNJ

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AMSAT-CA Formed

By Steve Stroh N8GNJ

*My speculation in **Zero Retries 0126** about forming an AMSAT organization for Canada... turned out to be prescient.*

In **Zero Retries 0126** last week, in Amateur Radio GEO Possibilities from the AMSAT-UK 2023 Colloquium, I wrote:

For example, given ESA's focus on their potential Amateur Radio GEO project to specifically address Canadian Amateur Radio satellite operators, I'd sign up to be a supporting member of a new AMSAT-CA in a heartbeat. Just sayin'.

For full context, other AMSAT organizations append their two alpha character country code to distinguish themselves from the original (US) AMSAT organization (sometimes labeled AMSAT-NA), including AMSAT-DL (Germany), AMSAT-UK (United Kingdom), [and many others](#).

Now we have AMSAT-CA / AMSAT Canada.

I was forwarded this email:

From: Stefan Wagener <redacted>
To: "info@amsat-ca.org" <info@amsat-ca.org>
Sent: Monday, November 27, 2023 at 12:31:23 PM CST
Subject: Amateur Radio Satellites and Systems – Canada (AMSAT-CA)

Hi folks,

I hope this email finds you well.

I am excited to inform you about the establishment and official incorporation of the “Amateur Radio Satellite and Systems – Canada” (AMSAT-CA) association (see attached announcement).

Please feel free to distribute the information to your members, stakeholders, and other relevant groups and individuals. We plan to reach out to you individually in the coming weeks to discuss common interests, collaboration, mutual support, and next steps.

Have a great week, and let me know if you have any questions.

73 Stefan VE4SW

Stefan Wagener VE4SW

President AMSAT-CA

This PDF was included with some more details:



Amsat Ca Av3
179KB · PDF file
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(Formatted for republication.)

AMSAT-CA November 27, 2023

Announcement



Amateur Radio Satellites and Systems – Canada (AMSAT-CA)

Amateur Radio Satellites and Systems – Canada (AMSAT-CA) was recently officially incorporated as a non-profit membership-based association within Canada.

The official board members who established the new Canada-based AMSAT organization are:

- Dr. Stefan Wagener, VE4SW (President)
- J.T. (Mitch) Mitchell, VE6OH (Vice President)
- Levente Buzas, VA7QF (Technical Director)
- John Langille, VE1CWJ (Director)
- Tom Anderson, VA6TA (Director)
- Dr. Witold Kinsner, VE4WK (Director)

Main Purpose:

The **Amateur Radio Satellites and Systems Canada Association (AMSAT-CA)** will promote, develop, and support amateur radio in space, including but not limited to amateur radio communication via man-made and natural satellites (e.g., the moon), amateur radio on space stations and planets, and related experiments, as well as new developments of (i) technology, (ii) methods and techniques, and (iii) new applications, all intended for use on satellites, ground stations, and terrestrial-space communications for the benefit of humanity.

Next steps:

AMSAT-CA is currently in the process of establishing its online profile, membership, and other business processes.

In the meantime, the board has started establishing a technical working group (Canada) to develop our position and ideas to support the proposal for a new European and Canadian geostationary amateur radio payload project, announced by *Frank Zeppenfeldt, PD0AP*, (ESA) at AMSAT-UK (2023): [YouTube link](#)

For more information and official correspondence, please get in touch with us at:

info@amsat-ca.org

This is *real*. I exchanged a brief email with VE4SW and received an immediate response indicating that it's *very* early days for the organization. That's borne out by the minimalist website - <https://amsat-ca.org/> which echoes the announcement PDF.

There are probably some who won't believe me, but when I wrote my article in **Zero Retries 0126** (2023-11-24), I had no advance notice... or even *any hint* that this was in the works. Obviously, given that AMSAT-CA is already

... officially incorporated as a non-profit membership-based association within Canada.

indicates that AMSAT-CA has been in the formation stages for... I'll guess at least a month as these sorts of legalities don't happen fast.

My article referencing AMSAT-CA was, to me, a logical development, but *entirely speculative*. But **wow**... this is great news, and congratulations to Canadian Amateur Radio Operators both for the potential for a Amateur Radio Geosynchronous / Geostationary Earth Orbit payload or satellite, and for a brand new space-oriented organization to knit together all the various Amateur Radio space-related activities across Canada, especially given Canada's extensive history with space and especially satellite technology. I look forward to visiting what will likely be a cluster of such activity in nearby Vancouver, British Columbia, Canada.

AMSAT-CA's activities, especially those related to GEO, will be closely followed here in Zero Retries.

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Amateur Radio Will Soon Lose Use of Most of the 1240 - 1300 MHz Band

By Steve Stroh N8GNJ

Most Amateur Radio Operators aren't aware that Amateur Radio use of the 1240 - 1300 MHz (23 cm) band is secondary to the allocation of this band worldwide for Global Navigation Satellite Systems (GNSS). The first, most widely known, and most heavily used GNSS system is the US Global Positioning System (GPS), built and operated by the US Department of Defense. There are other such systems which are now coming into widespread use, and apparently those systems / countries will soon, grudgingly, allow only limited Amateur Radio operations to continue in this band. Limited, compared to the largely unrestricted use of 60 contiguous MHz of UHF spectrum that Amateur Radio previously enjoyed.

My thanks to Mastadon user ftg@mastodon.radio for the pointer to this development.

Negotiations prior to the formal [World Radiocommunication Conference 2023](#) between the International Amateur Radio Union and the new GNSS system operators (Russia - GLONASS), Europe (GALILEO), and China (COMPASS) were able to preserve some limited Amateur Radio use of 1240 - 1300 MHz.

Kudos to IARU for negotiating a compromise that preserved *some* Amateur Radio operations in the band.

Unlike terrestrial spectrum allocations that are considered to be within the purview / regulatory domain of individual countries such as the US, or regional spectrum regulators such as OFCOM (Europe), *space* spectrum allocations tend to be observed worldwide, and coordinated internationally, especially for Low Earth Orbit (LEO) satellite systems such as GNSS that operate worldwide.

The details of this impending change are sobering - see the IARU presentation [ITU-R M.2164](#), especially Slide 8.

Summarising the technical conditions recommended as guidance to allow operation of the amateur and amateur satellite services whilst minimising the potential for interference to RNSS in the 23cm band. 23rd Nov 2023

The agreed-upon restrictions for 1240 - 1255.76 MHz (16 MHz) and 1258 - 1296 (38 MHz) effectively preclude Amateur Radio use of the combined 54 MHz of these two blocks, with this description:

Low mW level power only. In effect Amateur operation suppressed.

Although the blocks 1296 - 1298 MHz (50 watt TX limit) and 1298 - 1300 MHz (150 watt TX limit) *are preserved for Amateur Radio operations*, as I read the presentation, the widest bandwidth allowable in those blocks is 150 kHz, which is disappointing considering that wider bandwidths are becoming usable and viable for Amateur Radio such as New Packet Radio being able to do 1 Mbps in a 1 MHz channel.

The portion of the revised 1240 - 1300 MHz band available for "Broadband", 1255.76 - 1258 MHz (with two different maximum transmit power levels) is a total of 2.24 MHz. "Broadband" bandwidth is not defined in this presentation, but extrapolating that "Narrowband" is defined as < 150 kHz, "Broadband" in this new 1240 - 1300 MHz band is probably any bandwidth larger than 150 kHz.

“ftg’s” take:

- YES! Band is not gone.
- Not back to it's former glory. but not some evil joke like 25mW EIRP limit or something.
- But still very usable.
- And unlike now, I should not have to buy back the band in 25 kHz chunks if I want to operate on it.

It could have been worse, and it looks like the use of D-Star DD Repeaters that require a 100 kHz channel in 1240 - 1300 MHz will continue to be usable, though they may need to be changed in frequency to accommodate the remaining usable portions of the band. Again, kudos to the IARU team that negotiated continued access to some of 1240 - 1300 MHz.

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Digital Voice *or* Data - *Not* an Either Or Choice

By Steve Stroh N8GNJ

We can, and should, treat voice and data as equivalent and interoperable modes in Amateur Radio.

In his [Zero Bias editorial for October, 2023](#), Rich Moseson W2VU cautions that we should be careful not to lose the “humanity” experience of the human voice in our Amateur Radio activities in favor of digital modes:

But there is still something special, something different, something magical, about hearing distant voices coming through your speaker vs. seeing words from a distant computer scrolling across your screen. And we need to be careful not to lose that magic in pursuit of digital “progress.” We need to maintain a balance and exercise our microphones as well as our keyboards and keyers.

I’ve said on a number of occasions here in Zero Retries that I believe that data modes will inevitably become the dominant modulation method of transmission and reception on Amateur Radio, just as data modes are now almost exclusively used in current radio technology. My primary reason for that prediction is the rising and inevitable level of radio interference on Amateur Radio bands because such interference - from poorly designed / shielded switching power supply “wall warts”, solar panel inverters, leaking cable television systems, etc. that severely degrade the experience of using legacy analog radio modes. Such “noise” is below the threshold of notice for the now-dominant digital communications systems, and therefore of little concern outside of Amateur Radio. Another reason is that data modes are just more interesting to the current “digital native” generation of younger Amateur Radio operators such as those finding out about Amateur Radio through Hackaday.com, DEF CON, etc.

But that shift to data modes doesn’t preclude, as W2VU posits *using voice*.

In my opinion, digital voice in Amateur Radio is undergoing a technological improvement curve that will rapidly improve as we *use* improved algorithms for digitizing voice enabled by relentless progress in available, inexpensive compute power. Early digital voice [CODECs](#) were usable, but only just. The poor voice quality of those early (and currently in use) CODECs was a necessary compromise for the technology of the time - there weren’t fast enough (or cheap enough, or small enough, or power efficient enough) processors to compress / digitize voice without compromises in quality. But that early CODEC technology is now fossilized into a technological dead-end in *dedicated* digital voice systems over radio such as D-Star, Project 25 (P25), Digital Mobile Radio (DMR), System Fusion (SF).

Those early CODECs were also a product of the limited bandwidth and data rate available for use, designed to “shoehorn” voice into a 12.5 kHz channel, and eventually a 6.25 kHz channel (which notably, D-Star achieved).

In the 2020s, all of that calculus about Digital Voice has changed:

- We have access to incredible amounts of fast, cheap, small, power efficient processors to throw at the problem of digitizing voice. Thus that allows better, more compute-intensive algorithms for digitizing voice.
- We have access to better data rates such as the promised 9600 bps (potentially 19.2 kbps) with Forward Error Correction (FEC) in a 12.5 kHz channel promised by [MMDVM-TNC](#).
- On HF, the technology of [FreeDV](#) continues to evolve, being able to provide good quality voice, using less bandwidth than an equivalent Single Sideband (SSB) analog signal. Being software-based (and open source), FreeDV continues to evolve.

One of the more interesting voice / data merges that I’ve been watching is that [FreeDV](#) implements a highly capable modem technology for use on HF based in part on OFDM, but dedicated to *voice*. [FreeDATA](#) takes advantage of FreeDV’s very capable modem technology for *data*. They’re not (yet) interoperable, but these two implementations are now cooperating to some degree, per this [interesting mention by David Rowe VK5DGR](#):

In April and May I developed the datac4 and datac13 raw data modes to support [FreeDATA](#), that Simon immediately integrated and is now in daily use. The mode is capable of sending data down to around -8dB on poor quality HF channels, which has resulted in messages being sent all over the world using HF Radio and no other infrastructure. Here is a [map](#) of FreeDATA users. Here is some more [technical information](#) on the FreeDV raw data modes that have been developed.

My ideal scenario is that I can be conducting a text chat with a friend over radio and then we decide to switch over to voice, and the handover is seamless and text and voice are interleaved - the computer (or perhaps, finally, the *radio*) just figures it which mode is which based on a protocol ID. A good example of this is the D-Star DV Fast Data mode that can allocate most of the 4800 bps data stream of a D-Star transmission to date instead of digitized voice.

In such a scenario / well-designed next generation radio communications system, *voice* is just another mode, like text chatting, file transfer, bulletins, position reports, telemetry from a remote system, etc. We’re (clumsily, at the moment) lurching in that direction because of the capabilities now possible

with Software Defined Radio and the mixing and inspiration possible with the Open Source model of technology development.

Of course, outside Amateur Radio, this seamless voice / data interleaving is now the norm. We saw this first with the emergence of Voice Over IP (VOIP) - cheap / free telephone calls via the Internet. Voice over LTE is now in widespread use, and LTE was initially designed only for data / Internet access.

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More Thoughts on IPv6 - No "44Net" within IPv6

By Steve Stroh N8GNJ and Bill Buhler AF7SJ

In response to Amateur Radio TCP/IP Tunneling over Starlink in **Zero Retries 0109**, Bill Buhler AF7SJ sent me this very well worded perspective on Amateur Radio and IPv6. Somehow it got buried, and then overlooked in my notes for future issues until it surfaced a week or so ago. AF7SJ's perspective predated my recent discussions on using IPv6 with Starlink.

Thank you once again Steve for an informative newsletter.

Your section on the struggle of CGNAT services with Amateur radio services has triggered a few days of research to ensure that my instinct was correct, and now this rant.

In the early to mid 80's forward looking Amateur Radio packet operators worked within the IETF to reserve the 44.0.0.0/8 range of IP addresses for Amateur Radio usage, which has created a diverse and lively group of radio operators and experimenters supported by the ARDC, which we all know is one of Steve Stroh's favorite organizations, which is doing a lot of good for digital ham radio of all types.

I've come to feel, that unlike the pioneers of the previous two generations we have stagnated and are ignoring the greatest opportunities for large area ham radio experimentation, namely, IPv6.

IPv6 has been a very long time in coming, while it was declared ready for implementation before the year two thousand, it took years for manufacturers and developers built support into their products. But it now is available from most Internet Providers, and more importantly, most operating systems and off the shelf network products.

So what does IPv6 give us hams? Plentiful unique addresses for each device.

When the IETF realized that we would run out of IPv4 addresses they decided to build a system that would truly scale. They also decided they wanted to make things simpler to run so they made three key choices that simplify our ability to have lots of computers / experiments attached to a network.

1. They decided to use a 128 bit address rather than the 32 bit addresses of IPv4. This means that instead of roughly 4,294,967,296 possible addresses there are ~340,282,366,920,938,000,000,000,000,000,000,000 possible addresses.
2. They realized that every telecom link would now would be likely to have multiple computers attached to it, and even multiple networks.
3. They wanted it to be easy to place computers onto a network without worrying if the network could accommodate er.

Based on this they split the IPv6 addresses into three sections, the first designates the ISP you are attached to, in the example below this is represented by the number 1.

The second is the local subnet of your Internet link, which is represented by the number two. In the initial spec this was supposed to be a 16 bit number, with 65535 possible subnets per Internet link. Some ISPs have been greedy and are only distributing an eight bit or in some cases a four bit number.

Finally is the subnet portion, which is a sixty four bit number, which could hold 18,446,744,073,709,600,000 computers or addresses, if your firewall could keep track of that many devices (hint it couldn't come close).

1111:1111:1111:2222:3333:3333:3333:3333

So, zooming back out. StarLink supports IPv6. If we migrate our ham radio software to either use 6to4 tunneling, or just be IPv6 native, it is possible to have devices galore attached to each StarLink antenna. Suddenly a StarLink could be attached to an IPv6 aware New Packet Radio digipeater network and all could access the Internet or be accessed from the Internet. By the same token ARDEN could do the same thing.

There are of course the struggles with making sure we don't obscure the meaning of our communications, so TLS encryption needs to be considered, but that constraint is already an IPv4 issue and can be worked with.

Lets step sideways for a second as well. It is sad, but true that Amateur Radio hasn't been granted its own address space with IPv6 yet. I say yet, because there are some reserved parts of the space, and with the right RFC / committee member input it's possible we could have a section carved out for us. But, just as there are private IP ranges in IPv4, the familiar 10.0.0.0/8, 172.12.0.0/12, and 192.168.0.0/16 ranges. There are private ranges for IPv6 that organizations can leverage and I suggest that it would be appropriate for [AREDN] to coordinate private routes in the fd00::/8 range to prevent network collisions and allow local experimenters to build a private IPv6 Internet for our internal networks.

Thanks Steve for continuing to push digital ham radio forward.

My thanks to AF7SJ for not taking offense at my long-delayed response to his note.

It was delightful after all these years of dealing with the mess of IPv4 address shortages, and the workarounds of Network Address Translation (NAT), and then Carrier Grade NAT (CGNAT), to discover the "simplicity" of being able to have multiple IPv6 addresses available from your service provider - in my case, Starlink, that can be used, and used peer-to-peer, unlike users of many service providers who can only assign IPv4 NAT IP addresses.

AF7SJ's research on IPv6 echoes my own recent research on IPv6 for Amateur Radio. One of the surprising things I learned about IPv6 was that although there are supposed to be enough IPv6 addresses for every grain of sand on Earth, and more... there doesn't seem to be a way for an individual to obtain a dedicated block of IPv6 addresses. This is the official qualification ([at least for the US via ARIN](#)):

If you meet any of the criteria below, you qualify to receive IPv6 address space:

- Have an IPv4 assignment from ARIN or one of its predecessors
- Intend to immediately be IPv6 multi-homed
- Have 13 end sites (offices, data centers, etc.) within one year
- Use 2,000 IPv6 addresses within one year
- Use 200 /64 subnets within one year

Hmmm... as an individual... Nope, nope, nope, *maybe*, and nope.

So maybe that fourth bullet - 2000 IPv6 addresses in one year might be an entrée, but I'd have to think of something really creative to plausibly make a case for using 2000 IP addresses in one year as an individual. I have a lot of TNCs to get online, but not *that* many. Or maybe they don't require plausible justification, just a statement that you are *planning* to do so.

I'll guess that the operating assumption is that since IPv6 addresses are plentiful, and that will be the case "forever", whatever service provider you choose will be able to provide you with all the (routable) IPv6 addresses you'd ever need. And if not, as AF7SJ mentions, there are private (non-routable) ranges within IPv6 for experimentation use.

Another line of research is for my radio / interface interoperability testing project that I do want to assign each device a *static IP address*, and almost all of my devices and software that I plan to use just aren't modern enough for IPv6. Thus I obtained an isolated block of 44Net IPv4 addresses from ARDC for my experimentation. While ARDC has stated some vague plans for VPN Points of Presence, nothing seems imminent, so with my newly discovered IPv6 block thanks to Starlink, I was delighted to discover that tunneling IPv4 over IPv6 is quite doable, and thus when I want to grant remote access to a device in my lab, it looks like I'll be able to do so - they'll come in via IPv6, hit the router, authenticate, and their IPv6 packets will be transmogrified back and forth to IPv4 packets in my lab.

To AF7FJ's point about AREDN doing some work with IPv6, while I understand why he makes that suggestion given AREDN's use of Internet tunneling, I think it would be more appropriate for ARDC to get involved in IPv6 on behalf of Amateur Radio. It seems to me *a curious, and obvious lack* that ARDC hasn't continued its "44Net Mission" to obtain an allocation of IPv6 addresses for Amateur Radio use and experimentation, and do some coordination on behalf of Amateur Radio given that ARDC is the defacto organization representing Amateur Radio on matters of Internet connectivity.

Or maybe a small group will have to get together to meet ARIN's requirement for procuring an IPv6 address block...

Have 13 end sites (offices, data centers, etc.) within one year

such as the **Association of AREDN Supernodes**³ applying?

44Net and eventually ARDC was started with a [more humble ask](#) than this.

Leave a comment

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

[SDRconnect Preview 2 released](#)

The second preview build of [SDRconnect](#) is now available for download [here](#). It contains a number of new features, including:

- Direct frequency input
- Additional bands with IARU region support
- IQ recording (64-bit support in a single file)
- IQ playback as a device
- Asymmetrical filter editing in the Aux spectrum
- Notch filters in the Aux spectrum
- Plus other changes and bug fixes, for a full list you can find the release notes here: https://www.sdrplay.com/docs/SDRconnect_Release_Notes.pdf

SDRconnect is the cross-platform software for the SDRplay Software Defined Receivers. SDRplay's current software is Windows-only.

Tesla Cybertruck Uses 48 Volt Internal Bus

In **Zero Retries 0091**, I wrote Future Tesla Vehicles Will Use 48 Volt Internal Bus. See that article for the background on why this change is significant. On 2023-11-30, Tesla officially began [availability](#) and commenced the first deliveries (on stage) of the Cybertruck. (Trying to find a *reasonable* video to link is a hot mess, at least at time of editing this.)

It's notable that the Tesla Cybertruck is the first *production consumer vehicle* to use a 48 volt internal bus. Presumably somewhere in that sophisticated vehicle, which does include integrated 120 volt AC outlets, there are 12 volt outlet(s), hopefully capable of reasonable current of 10 amps or so. If so, it will be interesting to see how that's implemented as I *cannot imagine* a vehicle (or company) as sophisticated as this continuing to use the archaic *and dangerous* "cigarette lighter" socket. It's early days (Cybertruck sales are barely a day old as this issue will publish) and eventually such details will trickle out.

Some of the potential to use radios and computers in a Cybertruck has already been thought out, per by Larry Ellison and Oracle creating a [proof of concept of a Cybertruck as a next generation police vehicle](#). Police vehicles require the ability to use two-way radios.

Another interesting wrinkle of the Cybertruck and Amateur Radio... what will we do now that we cannot use magnetic mount antennas?

If I'm able to attend Hamvention 2024 next year, I hope there's at least one Cybertruck in attendance to show off the ability to install mobile radios (and perhaps a few computers). I think Bob Bruninga WB4APR (Silent Keyboard) would have been [very interested in the power and radio capabilities](#) of a Cybertruck.

"[Radio] Modems Are Hard"

Not related to Amateur Radio directly, but relevant to the discussion of needing more radio technology expertise, this article from CNBC about Apple making its own silicon is interesting in general. The Zero Retries Interesting discussion was about Apple continuing to struggle to build radio components:

'Modems are hard'

Apple isn't yet making every piece of silicon in its devices. Modems, for example, are one big component the company has yet to conquer on its own.

"The processors have been remarkably good. Where they've struggled is on the modem side, is on the radio side in the phones," Rasgon said. "Modems are hard."

Apple relies on Qualcomm for its modems, although in 2019, the two companies [settled a two-year legal battle](#) over intellectual property. Soon after, [Apple bought the majority of Intel's 5G modem business](#) for \$1 billion, in a likely move to develop its own cellular modem. That hasn't happened yet, and in September, Apple signed on with [Qualcomm to supply its modems through 2026](#).

"Qualcomm still makes the best modems in the world," Bajarin said. "Until Apple can do as good of a job, I have a hard time seeing them fully jump to that."

Apple's Srouji said he couldn't comment on "future technologies and products" but said "we care about cellular, and we have teams enabling that."

Apple is also [reportedly working on](#) its own Wi-Fi and Bluetooth chip. For now, it has a [fresh multibillion-dollar deal with Broadcom](#) for wireless components.

The good news for the US is that the "better than Apple in RF technology" company Apple is currently depending on includes US-based [Qualcomm](#) and US-based Broadcom. It's notable that over the years, Qualcomm has employed [4](#) a number of prominent Amateur Radio Operators such as Phil Karn KA9Q, Michelle Thompson W5NYV, and most notably, a Qualcomm co-founder Franklin Antonio N6NKF (Silent Keyboard). I think *that degree of hands-on, visceral experience* with radio technology by those Amateur Radio Operators paid abundant dividends to Qualcomm in its development of superior radio technology.

Will It Ham?

From [Amateur Radio Newsline Report 2404](#) for Friday November 24th, 2023:

KICKER: A LITTLE ANTENNA WITH A LOT OF CAN-DO

NEIL/ANCHOR: For our final story we ask: what can you do with a can of ham? Well, you can make a sandwich, for one thing - or you can make a contact on a local repeater. John Williams VK4JJW explains.

JOHN: Viewers of his YouTube channel, Ham Radio Rookie, now know that Ben Eadie VE6SFX has become a man with a can and a plan. The can once contained ham -- and the plan for the can was grand: Ben first ate the ham, washed the can and got to his plan. He turned it into an antenna.

That's right, an antenna. It was Ben's latest experiment on his channel's new feature called "Will it ham?" The 7-minute video shows him attaching a PVC pipe, adding a few 3D printed pieces to the assembly and putting a jumper on it to turn it into a slot antenna. After finding a likely feed point, he checks it with a NanoVNA and declares it beautifully resonant on 70cm and ready for a radio check on a local repeater with the help of a friend. He tells his friend "I am talking to you via a can of ham" and the good signal report that comes back is clearly no baloney. His friend asks: Would the antenna be as resonant if the ham were still inside? Ah, that's a question Ben could surely sink his teeth into.

Meanwhile, he tells YouTube viewers that he is in search of other possible projects that are too absurd for anyone else to do. What's in his future? Perhaps he'll turn a tin of tuna.....into a tuner.

I really gotta practice more with my NanoVNA. VE6SFX's YouTube channel is https://www.youtube.com/@VE6SFX_HamRadioRookie. I'm now subscribed.

Navigation Satellite (GNSS) Interference Is Very Real

In **Zero Retries 0070** - GNSS Jamming - Not Just For Military Operations? I discussed the potential potential of "GPS jamming" to disrupt systems that rely on time synchronization from GNSS satellites. This is a recent real-world example of that concern:

[Cisco aids Ukraine in cyber defense with modified switches to counter Russian attacks](#)

Cisco has proactively shipped modified switches to Ukrenergo, the state-owned electricity grid operator in Ukraine, to bolster its defenses against Russian cyberattacks targeting energy infrastructure. These attacks have included the use of GPS-jamming tactics, which disrupt the high-voltage energy subsystems crucial for power distribution and damage assessment.

The reliance of Ukraine's substations on GPS for time synchronization, a standard in industrial control systems for its accuracy and affordability, becomes a vulnerability when faced with such jamming. Disruptions in GPS signals hamper the synchronization of electricity subsystems, affecting the grid's operational status reporting and hindering the identification of issues like line breaks.

Cisco's response involved shipping a large order of modified equipment, specifically designed to maintain accurate time even under radio jamming conditions. This solution employs the Cisco Industrial Ethernet switch with an internal crystal oscillator, enabling new clock recovery algorithms for accurate timekeeping when GPS is unavailable.

I think there is a case to be made that Amateur Radio Operators could, inexpensively, voluntarily deploy a broad-based, national network of reasonable-quality GNSS receivers, uploading data via Internet, from their *surveyed* locations. In fact, it could probably be easily implemented as an add-on to the well-developed [SatNOGS network](#). If the Amateur Radio Operator's "house moves" (the location reported by the GNSS receiver changes), there's likely GNSS interference occurring that needs to be addressed.

Hambrew Magazine

Zero Retries Pseudostaffer Jeff Davis KE9V [discovered Hambrew Magazine](#):

If you can recall the specialty publication, **Hambrew Magazine**, you probably have a few gray hairs. It was published during the 90's in those golden days of the QRP movement. Touted as being *for amateur radio designers and builders*, it was published by George De Grazio, WF0K (now a Silent Key) from 1993 until 1997 and nearly every notable electronics designer in the QRP world in those days contributed to the work. Some have said **Hambrew** reminds them of [SPRAT](#) from the GQRP club and while it wasn't solely focused on QRP activities, there's a similar vibe.

I had not previously known about Hambrew Magazine (thus KE9V has earned his Pseudostaffer "pay" for the month). Just glancing through a few random issues is pretty cool - I definitely would have enjoyed receiving it and getting inspired with various projects and ideas

I'm less subtle than KE9V about the source of Hambrew's archives - [World Radio History, Hambrew Magazine](#) which contains all fifteen issues.

BBC Basic Is Now Open Source (and Cross Platform)

IANAP/C (I Am Not A Programmer / Coder)... I've only dabbled over the years and determined that the only way I would ever write code was with the help of a talented programmer, which seems to be "going my way" with the rise of AI "coding assistants". But I digress...

Over the years, I have read glowing accounts of how good BBC Basic was and how formative it was for a generation of UK techies as their first exposure to writing software. I was delighted to discover that BBC Basic is now not only open source, but [ported to a very wide variety of platforms including the Raspberry Pi](#). Between Raspberry Pi's extensive support for writing software in Python, and now this "programming with training wheels" BBC Basic (you can even write BBC Basic in a web browser), there's little justification to disclaim oneself as IANAP/C.

Leave a comment

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Feedback Loop

Comments on Zero Retries 0126 (and my pithy and clever replies).

My thanks to Paul Elliott WB6CXC and Billy for their interesting comments.

If you provide feedback via email, I may excerpt your feedback or include it in full. Unless you specifically grant me permission to include your name, I won't do so. Feedback may be lightly edited for clarity.

Join the Fun on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out

Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything*!
- **Founding Members who generously support Zero Retries financially:**
 - Founding Member 0000 - Steven Davidson K3FZT
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- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your [QRZ](#) page (or other web presence) and include a link:

<https://www.zeroretries.org>
- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- [Dan Romanchik KB6NU](#) mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- [RTL-SDR Blog](#) - *Excellent* coverage of Software Defined Radio units.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

Zero Retries is currently using the [Substack email publishing platform](#) to publish Zero Retries. It's particularly suitable for small newsletters as you can get started for no cost.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join ~~1000~~ **1100+** other subscribers:

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If you're a fellow smart person that uses **RSS**, there *is* an **RSS feed for Zero Retries**.

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

[Zero Retries / N8GNJ on Mastodon](#)

Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

2023-12-01

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Blanket permission granted for TAPR to use any Steve Stroh content for the TAPR Packet Status Register (PSR) newsletter (I owe them from way back).

[1](#)

Minor editorial correction of the relevant links to Zero Retries.

[2](#)

Gotta think of a better name...

[3](#)

To be clear, this is an entirely *imaginary* organization... but then so was AMSAT-CA one week ago.

[4](#)

Purely from my all-to-fallible memory...